

1     CLAIMS:

2           1.     A method of encapsulating a semiconductor device,  
3     comprising:

4                 providing at least one semiconductor device;

5                 providing a dispensing apparatus having a plurality of dispensing  
6     orifices proximate the at least one semiconductor device; and

7                 dispensing a liquid encapsulating material through the plurality of  
8     orifices and over the at least one semiconductor device.

9  
10           2.     The method of claim 1 wherein the liquid encapsulating  
11     material is dispensed onto the at least one semiconductor device.

12  
13           3.     The method of claim 1 further comprising curing the  
14     dispensed liquid encapsulating material.

15  
16           4.     The method of claim 1 wherein the dispensing comprises  
17     flowing the liquid encapsulating material simultaneously through the  
18     plurality of orifices.

1           5.    The method of claim 1 wherein the dispensing comprises  
2 moving at least one of the orifices relative to the at least one  
3 semiconductor device while flowing the liquid encapsulating material  
4 through the at least one orifice.

5  
6           6.    The method of claim 5 wherein the moving comprises  
7 moving the at least one semiconductor device.

8  
9           7.    The method of claim 5 wherein the moving comprises  
10 moving the at least one orifice.

11  
12           8.    The method of claim 1 wherein the at least one  
13 semiconductor device is an integrated circuit chip.

1           9.    A method of forming an electronic package, comprising:  
2           providing a circuit board comprising a circuit pattern;  
3           joining a semiconductor device to the circuit board in electrical  
4           connection with the circuit pattern;  
5           providing a dispensing apparatus having a plurality of dispensing  
6           orifices proximate the semiconductor device;  
7           dispensing liquid encapsulating material through the plurality of  
8           orifices and onto the semiconductor device; and  
9           curing the liquid encapsulating material.

10  
11           10.   The method of claim 9 wherein the dispensing comprises  
12           dispensing liquid through only one of the orifices and onto the  
13           semiconductor device, and dispensing liquid through a remainder of the  
14           plurality of orifices and onto the circuit board proximate the  
15           semiconductor device.

16  
17           11.   The method of claim 9 wherein the dispensing comprises  
18           dispensing liquid through at least one of the orifices and onto the  
19           semiconductor device, and dispensing liquid through a remainder of the  
20           plurality of orifices and onto the circuit board proximate the  
21           semiconductor device.  
22  
23

1           12. The method of claim 11 wherein the liquid dispensed  
2 through the remainder of orifices is the same as that dispensed through  
3 the at least one orifice.

4  
5           13. The method of claim 11 wherein the liquid dispensed  
6 through the remainder of orifices is different than that dispensed  
7 through the at least one orifice.

8  
9           14. The method of claim 11 wherein the dispensing through the  
10 remainder of orifices occurs simultaneously with the dispensing through  
11 the at least one orifice.

12  
13           15. The method of claim 11 wherein the remainder of orifices  
14 comprises at least four orifices.

15  
16           16. The method of claim 15 wherein the semiconductor device  
17 comprises a square-shaped lateral periphery.

18  
19           17. The method of claim 9 wherein the semiconductor device is  
20 an integrated circuit chip.

1           18. A method of encapsulating at least two semiconductor  
2 devices, comprising:

3           providing at least two semiconductor devices over a substrate;

4           providing a dispensing apparatus having at least two dispensing  
5 orifices, a first of the at least two dispensing orifices being received  
6 proximate a first of the at least two semiconductor devices and a second  
7 of the at least two dispensing orifices being received proximate a second  
8 of the at least two semiconductor devices; and

9           simultaneously dispensing a liquid encapsulating material through  
10 the at least two orifices and over the at least two semiconductor  
11 devices.

12  
13           19. The method of claim 18 wherein the liquid encapsulating  
14 material is dispensed onto at least one of the at least two  
15 semiconductor devices.

16  
17           20. The method of claim 18 wherein the liquid encapsulating  
18 material is dispensed onto both of the at least two semiconductor  
19 devices.

20  
21           21. The method of claim 18 further comprising curing the  
22 dispensed liquid encapsulating material.  
23

1           22. The method of claim 18 wherein the dispensing comprises  
2 moving the at least two orifices relative to the semiconductor devices  
3 while flowing the liquid encapsulating material through the at least two  
4 orifices.

5  
6           23. The method of claim 18 wherein the semiconductor devices  
7 are integrated circuit chips.

8  
9           24. A method of encapsulating a plurality of semiconductor  
10 devices, comprising:

11           providing a plurality of semiconductor devices over substrate;

12           providing a dispensing apparatus having an array of dispensing  
13 orifice sets, individual sets of the array being in correspondence with  
14 individual semiconductor devices of the plurality of semiconductor  
15 devices; and

16           simultaneously dispensing liquid encapsulating material through  
17 orifices of different sets.

1           25. The method of claim 24 wherein the array of dispensing  
2 orifice sets is aligned with a first array of the plurality of semiconductor  
3 devices during the dispensing, the method further comprising moving the  
4 array dispensing orifice sets to alignment with a second array of  
5 semiconductor devices after the dispensing.  
6

7           26. The method of claim 24 wherein the liquid encapsulating  
8 material dispensed through each of the different sets is the same.  
9

10          27. The method of claim 24 further comprising curing the  
11 dispensed liquid encapsulating material.  
12

13          28. The method of claim 24 wherein the dispensing comprises  
14 moving at least some of the orifices relative to the semiconductor  
15 devices during the dispensing.  
16

17          29. The method of claim 24 wherein the semiconductor devices  
18 are integrated circuit chips.  
19  
20  
21  
22  
23

1           30. The method of claim 24 wherein the individual sets comprise  
2 at least one interiorly located orifice and remaining orifices peripheral  
3 to the at least one interiorly located orifice, the dispensing from an  
4 individual set comprising:

5           dispensing a first liquid encapsulating material through the at least  
6 one interiorly located orifice and over a corresponding semiconductor  
7 device; and

8           dispensing a second liquid encapsulating material through the  
9 remaining orifices and over a portion of the substrate proximate the  
10 corresponding semiconductor device.

11  
12           31. The method of claim 30 wherein the at least one interiorly  
13 located orifice is one orifice, and wherein the remaining orifices are  
14 four orifices.

15  
16           32. The method of claim 30 wherein the first and second liquid  
17 encapsulating materials are the same.

18  
19           33. The method of claim 30 wherein the dispensing through said  
20 at least one interiorly located orifice occurs simultaneously with the  
21 dispensing through said remaining orifices.



1           34. The method of claim 30 wherein the dispensing through said  
2 at least one interiorly located orifice occurs after the dispensing through  
3 said remaining orifices.

4  
5           35. A method of encapsulating a plurality of semiconductor  
6 devices, comprising:

7           providing a plurality of semiconductor devices over substrate;

8           providing a dispensing apparatus having an array of spaced  
9 dispensing orifices, individuals of the array being in correspondence with  
10 individual semiconductor devices of the plurality of semiconductor  
11 devices; and

12           simultaneously dispensing liquid encapsulating material through at  
13 least two of the spaced dispensing orifices and onto at least two of the  
14 individual semiconductor devices.

1           36. A method of forming an electronic package, comprising:  
2           providing a circuit board comprising a circuit pattern;  
3           joining a plurality of semiconductor devices to the circuit board  
4           in electrical connection with the circuit pattern;  
5           providing a dispensing apparatus having a plurality of dispensing  
6           orifices proximate the semiconductor devices;  
7           simultaneously dispensing liquid encapsulating material through at  
8           least two of the plurality of orifices and over at least two of the  
9           semiconductor devices; and  
10          curing the liquid encapsulating material.

11  
12          37. The method of claim 36 wherein the dispensing comprises  
13          dispensing the liquid onto the at least two semiconductor devices.

14  
15          38. The method of claim 36 wherein the dispensing comprises:  
16          dispensing a first liquid encapsulating material through the at least  
17          two orifices and over the at least two semiconductor devices; and  
18          dispensing a second liquid encapsulating material through a  
19          remainder of the plurality of orifices and onto portions of the circuit  
20          board proximate the at least two semiconductor devices.

1           39. The method of claim 38 wherein the liquid dispensed  
2 through the remainder of orifices is the same as that dispensed through  
3 the at least two orifices.  
4

5           40. The method of claim 38 wherein the dispensing through the  
6 remainder of orifices occurs simultaneously with the dispensing through  
7 the at least two orifices.  
8

9           41. The method of claim 38 wherein the dispensing through the  
10 remainder of orifices occurs before the dispensing through the at least  
11 two orifices.  
12

13           42. The method of claim 36 wherein the semiconductor device  
14 is an integrated circuit chip.  
15  
16  
17  
18  
19  
20  
21  
22  
23

1           43. A method of forming an electronic package, comprising:  
2           providing a circuit board comprising a circuit pattern;  
3           joining a plurality of semiconductor devices to the circuit board  
4           in electrical connection with the circuit pattern, the semiconductor  
5           devices being arranged in a plurality of arrays;  
6           providing a dispensing apparatus having a plurality of dispensing  
7           orifices proximate some of the semiconductor devices, the dispensing  
8           orifices being arranged in a single array of orifice sets which is aligned  
9           with a single of the semiconductor device arrays;  
10           simultaneously dispensing liquid encapsulating material through the  
11           array of orifice sets and over the single array of semiconductor devices;  
12           moving the orifice sets to align with another of the semiconductor  
13           device arrays; and  
14           simultaneously dispensing liquid encapsulating material through the  
15           array of orifice sets and over the other array of semiconductor devices.

16  
17           44. The method of claim 43 wherein the individual orifice sets  
18           comprise five orifices.  
19  
20  
21  
22  
23

1           45. The method of claim 43 wherein the individual orifice sets  
2       comprise at least two orifices, and wherein the dispensing from an  
3       individual orifice set comprises:

4           dispensing a first liquid encapsulating material through one of the  
5       at least two orifices and over an individual of the plurality of  
6       semiconductor devices; and

7           dispensing a second liquid encapsulating material through a second  
8       of the at least two orifices and over portions of the circuit board  
9       proximate the individual semiconductor device.

10  
11           46. The method of claim 45 wherein the first and second liquid  
12       encapsulating materials are the same.

13  
14           47. The method of claim 45 wherein the first and second liquid  
15       encapsulating materials are different.

16  
17           48. The method of claim 45 wherein the first and second liquid  
18       encapsulating materials are dispensed simultaneously.

1           49. The method of claim 43 wherein the orifice sets comprise  
2 at least one interiorly located orifice and remaining peripherally located  
3 orifices, and wherein the dispensing from an individual orifice set  
4 comprises:

5           dispensing a first liquid encapsulating material through said at  
6 least one interiorly located orifice and onto an individual of the  
7 plurality of semiconductor devices; and

8           dispensing a second liquid encapsulating material through said  
9 remaining orifices and onto portions of the circuit board proximate the  
10 individual semiconductor device.

11  
12           50. The method of claim 43 wherein the orifice sets comprise  
13 five orifices, and wherein the dispensing from an individual orifice set  
14 comprises:

15           dispensing a first liquid encapsulating material through one of the  
16 five orifices and onto an individual of the plurality of semiconductor  
17 devices; and

18           dispensing a second liquid encapsulating material through a  
19 remaining four of the five orifices and onto portions of the circuit  
20 board proximate the individual semiconductor device.

1           51. The method of claim 50 wherein the first and second liquid  
2 encapsulating materials are the same.

3  
4           52. The method of claim 50 wherein the first and second liquid  
5 encapsulating materials are dispensed simultaneously.

6  
7           53. A method of forming an electronic package, comprising:  
8           providing a circuit board comprising a circuit pattern;  
9           joining a plurality of semiconductor devices to the circuit board  
10 in electrical connection with the circuit pattern, the semiconductor  
11 devices being arranged in a plurality of arrays;  
12           providing a dispensing apparatus having a plurality of spaced  
13 dispensing orifices proximate some of the semiconductor devices, the  
14 spaced dispensing orifices being arranged in a single array which is  
15 aligned with a single of the semiconductor device arrays;  
16           simultaneously dispensing liquid encapsulating material through the  
17 array of orifices and over the single array of semiconductor devices;  
18           moving the orifices to align with another of the semiconductor  
19 device arrays; and  
20           simultaneously dispensing liquid encapsulating material through the  
21 array of orifices and over the other array of semiconductor devices.  
22  
23

1           54. A semiconductor device encapsulator comprising:  
2           at least one vessel configured for containing liquid encapsulant  
3           material;  
4           a liquid dispensing apparatus in fluid communication with the  
5           vessel, the apparatus having a plurality of dispensing orifices, at least  
6           one of the dispensing orifices being configured for receipt over and  
7           within lateral confines of a semiconductor device being encapsulated.  
8

9           55. The encapsulator of claim 54 comprising only one vessel.  
10

11           56. The encapsulator of claim 54 further comprising at least one  
12           other of the dispensing orifices configured for receipt outside of the  
13           lateral confines of a semiconductor device being encapsulated.  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23



1           57. A semiconductor device encapsulator configured to  
2 encapsulate a plurality of semiconductor devices which are joined to a  
3 circuit board, the encapsulator comprising:

4           at least one vessel configured for containing liquid encapsulant  
5 material;

6           a dispensing apparatus having an array of dispensing orifice sets  
7 in fluid communication with the vessel, individual sets of the array being  
8 in correspondence with individual semiconductor devices of the plurality  
9 of semiconductor devices; and

10          the device being configured to simultaneously dispense liquid  
11 encapsulating material from the vessel and through orifices of different  
12 sets to simultaneously cover different semiconductor devices with the  
13 encapsulating material.

14  
15          58. The encapsulator of claim 57 wherein each set comprises at  
16 least one dispensing orifice configured for receipt over and within lateral  
17 confines of a semiconductor device in correspondence with the set, and  
18 at least one other of the dispensing orifices configured for receipt  
19 outside of the lateral confines of the semiconductor device in  
20 correspondence with the set.

1           59. The encapsulator of claim 57 wherein each set comprises  
2 only one dispensing orifice configured for receipt over and within lateral  
3 confines of a semiconductor device in correspondence with the set, and  
4 four other of the dispensing orifices configured for receipt outside of  
5 the lateral confines of the semiconductor device in correspondence with  
6 the set.  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23

1           60. A semiconductor device encapsulator configured to  
2 encapsulate a plurality of semiconductor devices which are joined to a  
3 circuit board and arranged in a plurality of arrays, the encapsulator  
4 comprising:

5           a dispensing apparatus having a plurality of dispensing orifices, the  
6 dispensing orifices being arranged in a single array of orifice sets which  
7 is aligned with a single of the semiconductor device arrays;

8           the apparatus being configured to:

9                 simultaneously dispense liquid encapsulating material through  
10 the array of orifice sets and over more than one of the  
11 semiconductor devices of the single array of semiconductor  
12 devices;

13           move the orifice sets to align with another of the  
14 semiconductor device arrays; and

15           simultaneously dispense liquid encapsulating material through  
16 the array of orifice sets and over more than one of the  
17 semiconductor devices of the other array of semiconductor devices.  
18  
19  
20  
21  
22  
23